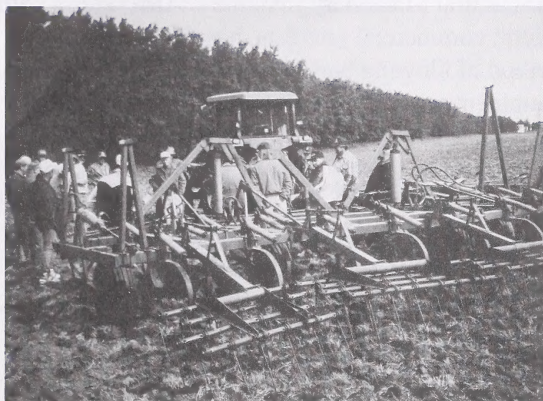




THE  
**ENGINEERING  
IN AGRICULTURE**  
NEWSLETTER

CANADIANA

JAN 24 1995



## Tractor Performance Clinics

*Reed Turner, Project Engineer, AFMRC, Lethbridge*

The smell of diesel smoke and the roar of working engines wafted through north central Alberta. Engineers, in a cooperative effort with Montana State University Northern, presented a series of five tractor performance clinics. These one and one-half day programs were a "hands on" experience filled with real examples of how and how not to adjust and operate a tractor. Tonnes of visual aids were used, including a complete diesel engine and dynamometer setup. As part of the program, a

tractor supplied by a local farmer was evaluated for proper weight distribution and adjustments. If adjustments were required, corrections were made and the tractor was re-evaluated. Results show that the available drawbar power increased by over 5%. In one case, the correct setup showed a 10% power increase!

Interest in the clinics was excellent and there were several requests for repeat performances. The Alberta Farm Machinery Research Centre and the Print Media Branch are currently making clinic information available in video format. Anyone interested in obtaining information or sponsoring a clinic should contact Reed Turner at 329-1212.

## Water Quality Initiative by the Beef Industry

*Brian West, Waste Management Specialist, Red Deer*

Water quality has become an important issue in Alberta. Organic contamination due to uncontrolled runoff from feedlots and overwintering sites is taxing water treatment equipment and resources. The Alberta Cattle Commission (ACC), along with other producer organizations, is working with

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**Alberta**  
AGRICULTURE, FOOD AND  
RURAL DEVELOPMENT  
Engineering Services



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The purpose of this newsletter is to advise of activities and projects being conducted by Alberta Agriculture, Food and Rural Development's Engineering Services and Regional Agricultural Engineering staff. For further information on these projects and other engineering related activities contact:

Lethbridge  
Red Deer  
Barrhead  
Edmonton (Eng. Services)

381-5112  
340-5322  
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Vermilion  
Fairview  
Lethbridge (AFMRC)

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835-2291  
329-1212

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Environmental Protection and Alberta Agriculture, Food and Rural Development to develop a strategy to deal with these problems.

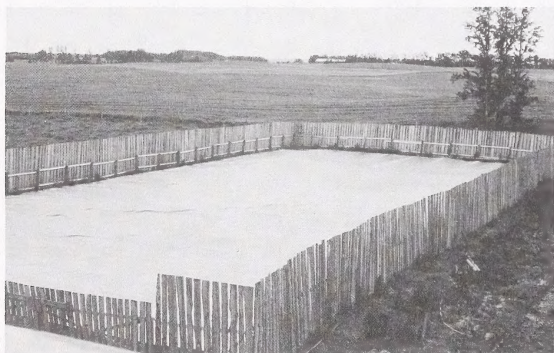
Projected growth of the beef industry indicates that water quality issues must be addressed now rather than later! The beef industry is responding to these problems and should be complimented for their efforts. The Engineering Services Branch is helping the industry through innovative demonstration projects and technology transfer. Several joint projects and activities relating to both water supply and the impact of the industry on water quality are currently underway. Partners include CAESA (Canada/Alberta Environmentally Sustainable Agriculture), ACC and Public Lands Branch.

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## Lagoon Odour Control

Wayne Winchell, Regional Engineer, Barrhead  
Brian West, Waste Management Specialist, Red Deer

The results are in! The project goal (as previously reported in *The Wind and the Odour*, Spring 1993), was to measure the amount of odour from a swine manure lagoon. To reduce odour, an 8-foot high windbreak fence was built around the lagoon. Later, a cable suspended plastic tarp was added to cover the lagoon surface.



The windbreak fence reduced odour frequency by an estimated 28%. "High" odour level occurrence (as judged by several individuals living adjacent to the site) was cut in half. The cost of the fence, including labour, was \$3 per lineal foot. When the tarp cover was added in 1993, the odour frequency was reduced by an estimated 67%. "High" odour levels

were virtually eliminated by using the fence and the tarp cover. Cost of the tarp cover, including installation and labour was 25 cents per square foot. The main disadvantage to this system is the physical problem associated with the placement and removal of the large tarp.

Most structural covers are too expensive to be practical. Development work evaluating the placement of floating organic material (such as peat moss or various types of crop residue) onto the lagoon is currently underway. In Saskatchewan, the Prairie Agricultural Machinery Institute (PAMI) along with several commercial interests, has developed a method of blowing barley straw onto lagoons. This equipment was recently tested in central Alberta. Two storages were successfully covered. A third storage site was not, due to its large size and unfavourable wind conditions. Engineering Services will continue to monitor these storages for odour abatement, ease of clean out and straw buoyancy.

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## Impact Damage to Peas and Beans

Kris Chawla, Processing Engineer, Edmonton

A study investigating the extent and cause of physical damage (splits and cracks) to grain resulting from free fall is now complete. "Express" peas and small red beans were dropped from various heights at different temperatures and moisture contents onto different impact surfaces. The velocity of different seed types were recorded just before impact. Germination tests were conducted on all seed lots after impact damage had occurred.

Three drop heights of 14, 24, and 54 feet were chosen to represent typical grain handling facility drop heights. Bean moisture contents were adjusted to 11.13%, 15.39% and 21.38%, while pea moisture contents were adjusted to 12.81%, 16.86% and 20.48%. Concrete, metal and seed on seed were used as the impact surfaces. To simulate summer and winter conditions, tests were conducted at temperatures of 22°C and -15°C.

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It was observed that the single seed velocity of peas was 46 ft/sec from a drop height of 54 feet, 9% faster than for beans. Less aerodynamic drag could account for the greater velocity of the peas.

Physical damage to both pulse crops increased at lower temperatures. The bar graphs (shown below) illustrate the average physical damage to the seeds when dropped onto a metal surface from various heights at -15°C.

## Harvesting Solid Seeded Beans

Robert Maze, Project Engineer, AFMRC, Lethbridge  
John Kienholz, Mechanical Engineering Technologist, Edmonton  
Marshall Eliason, Farm Machinery Engineer, Edmonton

The low price of wheat, NAFTA opening the Mexican Bean Markets to Canada and the building of two new bean plants in southern Alberta are all elements that should increase the number of acres seeded to beans. One factor slowing the increase in bean acreage is the high cost of equipment. Engineers are addressing the problem by exploring modifications to conventional equipment for bean production. The ability to use conventional grain equipment offers farmers a valuable alternative to cereal grain production without the extra cost of specialized equipment.

Direct cut harvesting of solid seeded beans with conventional equipment is not a viable option. Shatter and cutter bar losses can exceed 50% of the total crop. Tests on several prototype designs to reduce shatter and cutter bar losses were completed this fall. Combinations of prototype lifters and air reels were used to determine if preliminary designs are headed in the right direction. Engineers also monitored the movement of beans into the combine at various travel and reel speeds to gain a better understanding of the problem.

## Five New Double Shoot Openers Added to Evaluation

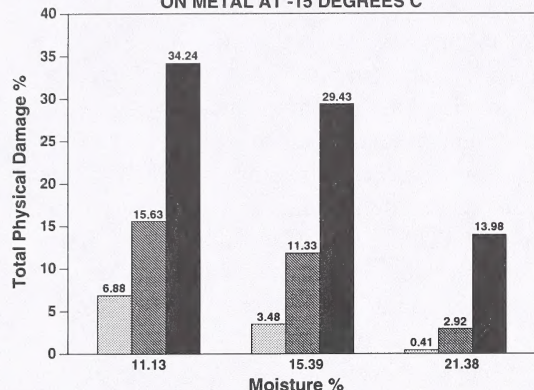
Lawrence Papworth, Project Engineer, AFMRC, Lethbridge

Evaluations have been completed on thirteen different double shoot openers at the Alberta Soil Bin Test Facility located in Lethbridge. Recently, Flexicoil's single and paired row opener, the Gen T2x2, and openers from Poirier and Swede were tested.

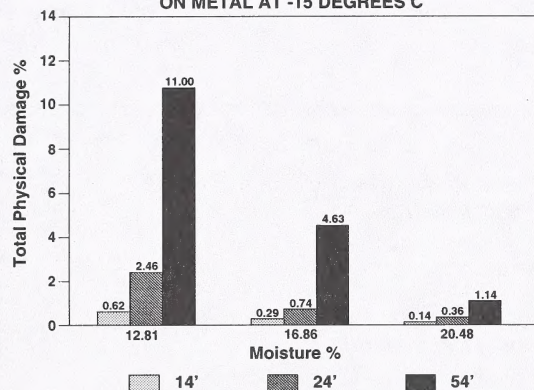
Each opener planted four to five acres. Evaluations were based on seed and fertilizer placement, soil disturbance and penetrating ability in different soil types. Field draft tests will be completed this fall.

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**DAMAGE TO BEANS AT VARIOUS DROP HEIGHTS ON METAL AT -15 DEGREES C**



**DAMAGE TO PEAS AT VARIOUS DROP HEIGHTS ON METAL AT -15 DEGREES C**



Results indicate that lower temperatures and moisture content caused increased damage to both pulse crops. The increase in drop height was also a significant factor with increased damage. For a copy of the report, contact Kris Chawla at 427-2181.



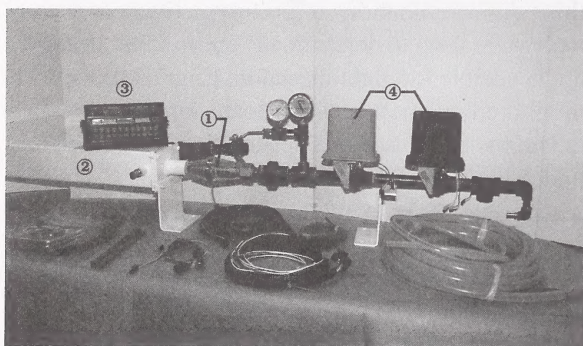
An interim report is available for the double shoot opener evaluations completed in 1993. A combined report will be written this winter. Plans have been initiated to test these openers' suitability for use with anhydrous ammonia while seeding.

## Using Automatic Controllers for Anhydrous Ammonia

*Lawrence Papworth, Project Engineer, AFMRC, Lethbridge*

The latest addition to anhydrous ammonia ( $\text{NH}_3$ ) equipment is the electronic controller. Four models currently on the market are undergoing testing at the Alberta Farm Machinery Research Centre in Lethbridge.

The purpose of the electronic controller is to provide uniform flow from the  $\text{NH}_3$  meter. This unit compensates for changes in tractor speed, temperature and pressure that have caused application problems in the past.



A liquid meter① measures the ammonia flow. To provide pure liquid, the  $\text{NH}_3$  passes through a heat exchanger② that is similar to a cold-flo<sup>®</sup> converter. The desired  $\text{NH}_3$  flow rate, machine speed and width information is processed by the controller③, to automatically adjust the control valves④.

Three of the four systems tested use a controller that is similar to a field sprayer controller. All systems provide a control switch to allow the operator to adjust nitrogen rates on-the-go. Early test results are quite favourable. A complete report should be available in 1995.

## Wireless Communication for Cows and Sheep

*Giang Truong, Electronics Technologist, AFMRC, Lethbridge*  
*Robert Maze, Project Engineer, AFMRC, Lethbridge*

The Alberta Farm Machinery Research Centre is presently working with Agriculture Canada to design a system to monitor the heart rate, temperature and chewing activity of cows and sheep. Scientists at Agriculture Canada are interested in using remote monitoring on the animals as part of their ongoing nutrition and animal stress studies.

Since animals are not very good at using cellular phones, engineers are using telemetry to monitor their activity. Small, lightweight transmitters placed on the animals send information to receivers in Agriculture Canada's computers via radio frequency and analog and digital signals. Other project components include data acquisition, sensor amplifier design, interface circuit and computer programs for acquisition, handling and storage of the data.

The project has been a challenge. Weight of the transmitters, batteries and antennas has to be less than 500 grams, with a battery life of at least one week. The signals will be transferred over a distance of 250 metres. Completion has been set for the fall.

### Alberta Events '94 - '95

#### **Alberta Pulse Growers Commission Annual Meeting**

*December 5 - 7, 1994*  
*Westin Hotel, Edmonton*

#### **Alberta Canola Producers Commission Annual Convention**

*January 17 - 19, 1995*  
*Grande Prairie*

#### **Alberta Conservation Tillage Society Soil Conservation Workshop and Annual Meeting**

*February 23 - 25, 1995*  
*The Westerner, Red Deer*

#### **Northlands Farm and Ranch Show**

*March 22 - 25, 1995*  
*Northlands Agricom, Edmonton*